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Aug 1st, 1957

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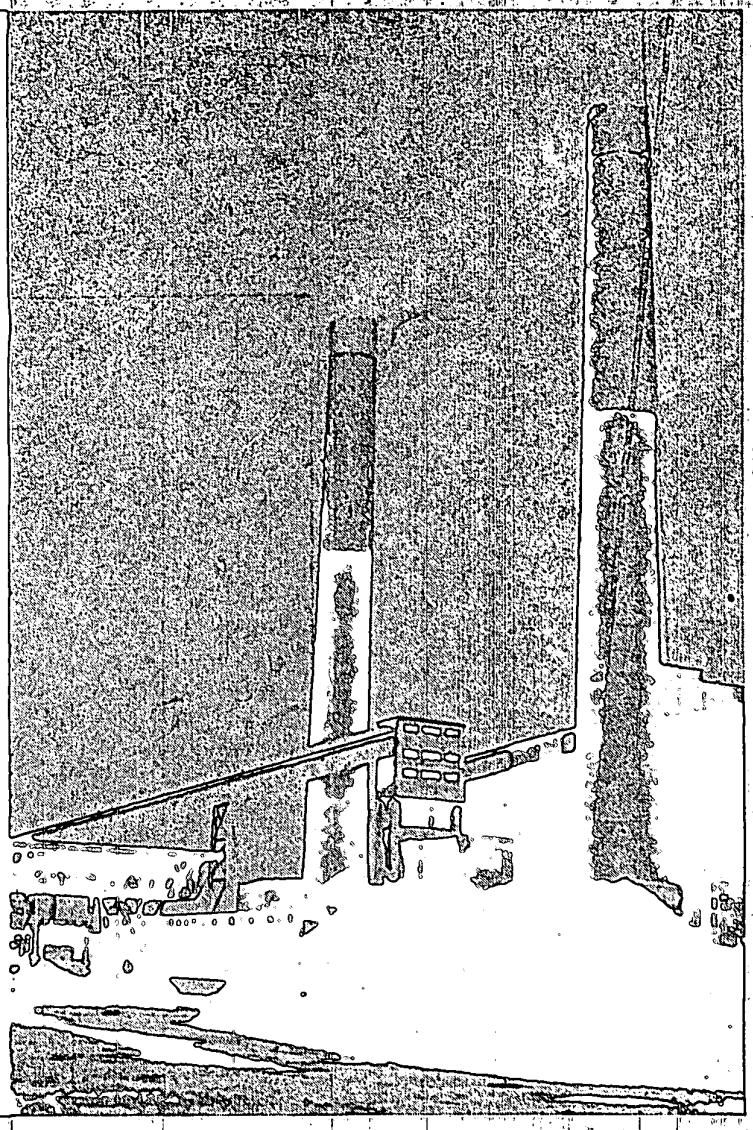

BLACHOWNIA POWER STATION
(POLAND)

BLACHOWNIA POWER STATION

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Blachownia Power Station is one of the largest and most modern power plants being built during the first five years economy development plan (1956—1960). The first boiler-turbo alternator set (block) was set in operation on the 30 th October 1957. At that time it well balanced the peak load in the autumn-winter period 1957 1958. The erection of the power plant is to be finished in 1960.

1. BRIEF DESCRIPTION OF THE POWER STATION

The power plant is being built in two stages — the first stage with a capacity of 220 MW (Blachownia I) and the second one with 140 MW (Blachownia II).

The total capacity of the power plant will be 360 MW. This output was designed on the basis of the power balance. In the first stage four boiler—turbo-alternator sets (blocks) had been erected (Blachownia I).

Each of these blocks consists of:

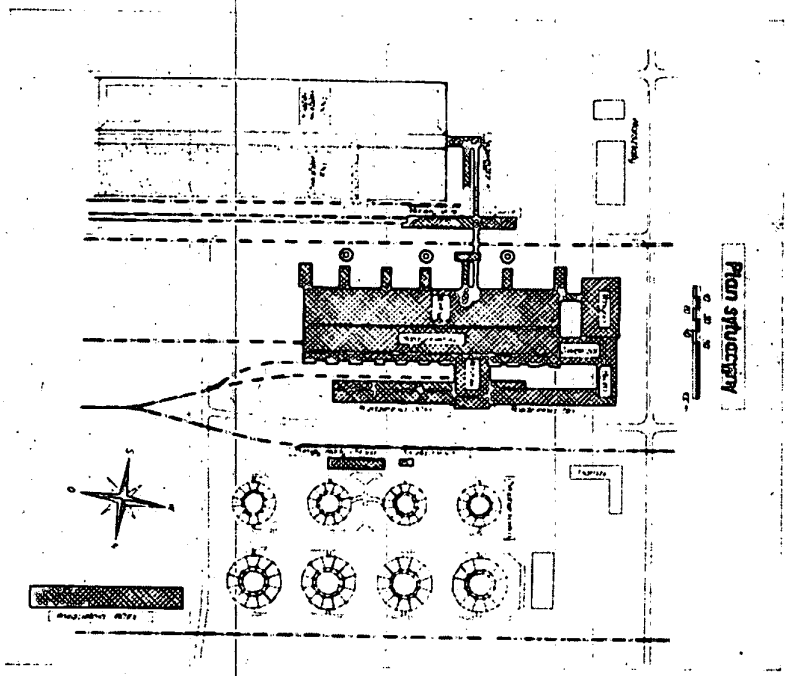
a) two boilers, with 120 t/h steam output each, pressure 112/107 kg/cm², superheated steam temperature 515°C,

b) one turbo-alternator set of 55 MW capacity steam pressure 95 kg/cm², steam temperature 510°C, circulating water temperature 27°C.

In the second stage of construction (Blachownia II) two blocks will be installed, each constisting of:

a) one Benson type boiler with 190 237 t/h steam output, steam pressure 190 kg/cm², superheated steam temperature 555°C, interstage steam reheating to 550 C, feed water temperature 240 250°C,

b) one turbo-alternator set of 70 MW capacity, steam pressure 180 kg/cm², steam temperature 550°C, circulating water temperature 24°C.



Site plan

2. DELIVERY OF EQUIPMENT

The main supplier of Blachownia Power Station's equipment is the Austrian firm Siemmering - Graz - Pauker. This company cooperates, so far as Blachownia Power Station is concerned, with Siemens - Schuckertwerke (German Federal Republic), further with Siemens - Schuckert (Austria) and Siemens Halske (Austria).

An important part of the equipment is being supplied by the Polish industry. The erection is being executed by Polish firms such as Energobudowa, Energomontaż, Energoaparatura etc.

3. SCHEDULE OF PERFOMANCE AND TECHNICAL INFORMATION (BLACHOWNIA I)

BOILER —

with four corner burners

Manufacturer	S. G. P.
Economic steam output	100 t h
M. C. steam output	120 t h
Concession pressure	112 kg/cm²
Working pressure in the drum	107 kg/cm²
Steam pressure at superheater outlet	101 kg/cm²
Steam temperature at superheater outlet	515°C
Feed water temperature	210°C
CO_2 contents in flue gas	14%
Efficiency at 100 t h economic output	88%
Efficiency at 120 t/h M. C. output	87%
Four coal pulverisers bowl mill type directly coupled to mill fans	
Electrostatic precipitators with an efficiency of	97% ± 2%

TURBINE —

Condensation, reaction type two-cylinder turbine with Curtiss wheel

Manufacturer	S. S. W.
Capacity (economic/M. C. R.)	50 55 MW
Rated pressure	95 kg cm²
Rated temperature	510°C
Max. pressure	110 kg cm²
Max. temperature	520°C
Speed	3000 revs/min

CONDENSER —

built of two parts	
Cooling surface	3010 m²
Circulating water temperature	
rated	27°C
max.	35°C
Circulating water quantity	9500 m³ h

ALTERNATOR —

Manufacturer	S. S. W.
Capacity	69 MVA
Power factor	0,8
Voltage	10,5 kV
Hydrogen cooled	

FEED WATER PUMPS —

Two electrically driven feed water pumps for one block	
Rated capacity	269 m³/h
Pressure	150 kg/cm²
Water temperature	135°C
Rating of motor	1350 kW

ELECTRIC EQUIPMENT —

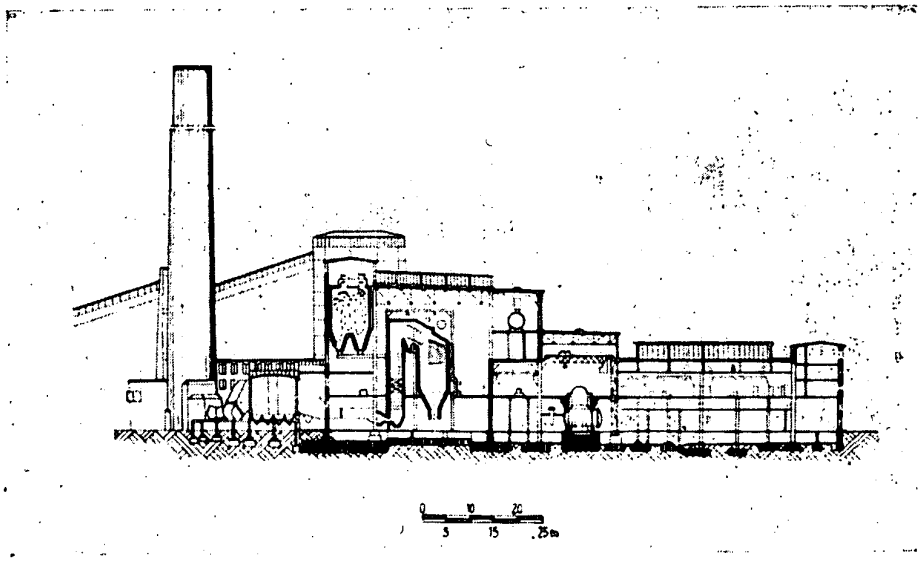
All electric equipment as was as the control and measuring instruments were supplied by S. S. W.

CIRCUIT BREAKERS —

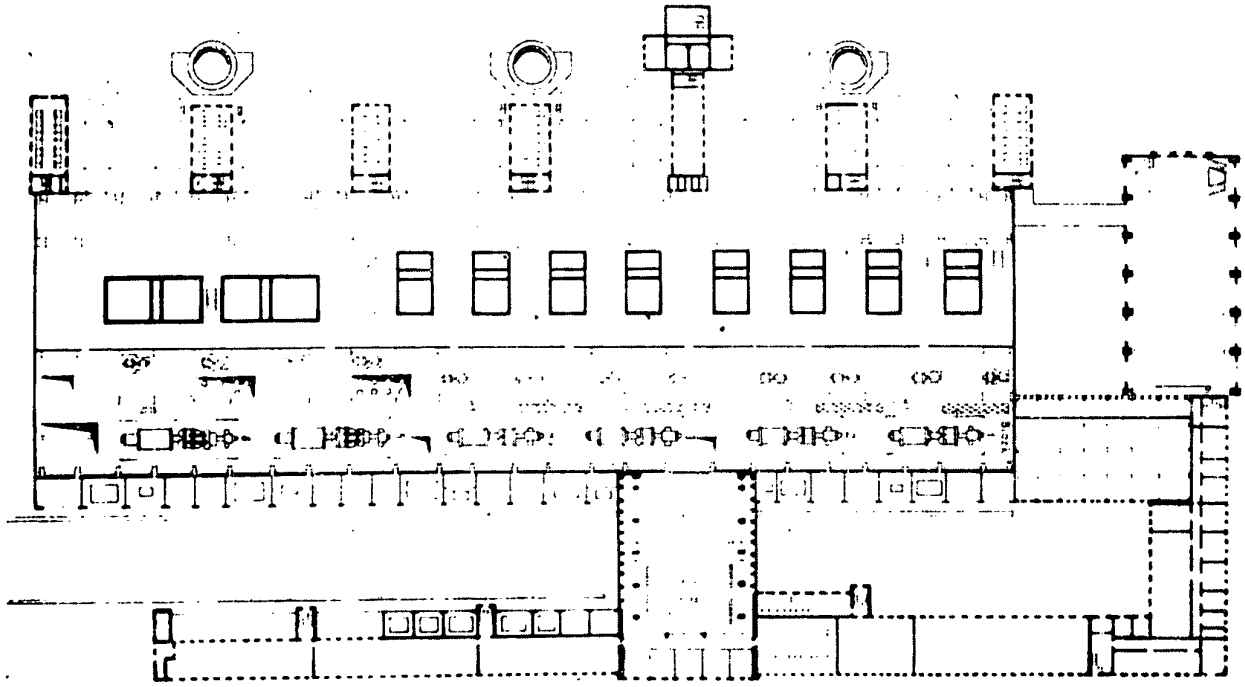
110 kV low oil content circuit breakers, interrupting capacity 3500 MVA

30 kV-expansion circuit breakers, interrupting capacity 1000 MVA

6 kV-expansion circuit breakers, interrupting capacity 100 to 200 MVA



Sectional view



Main building site plan

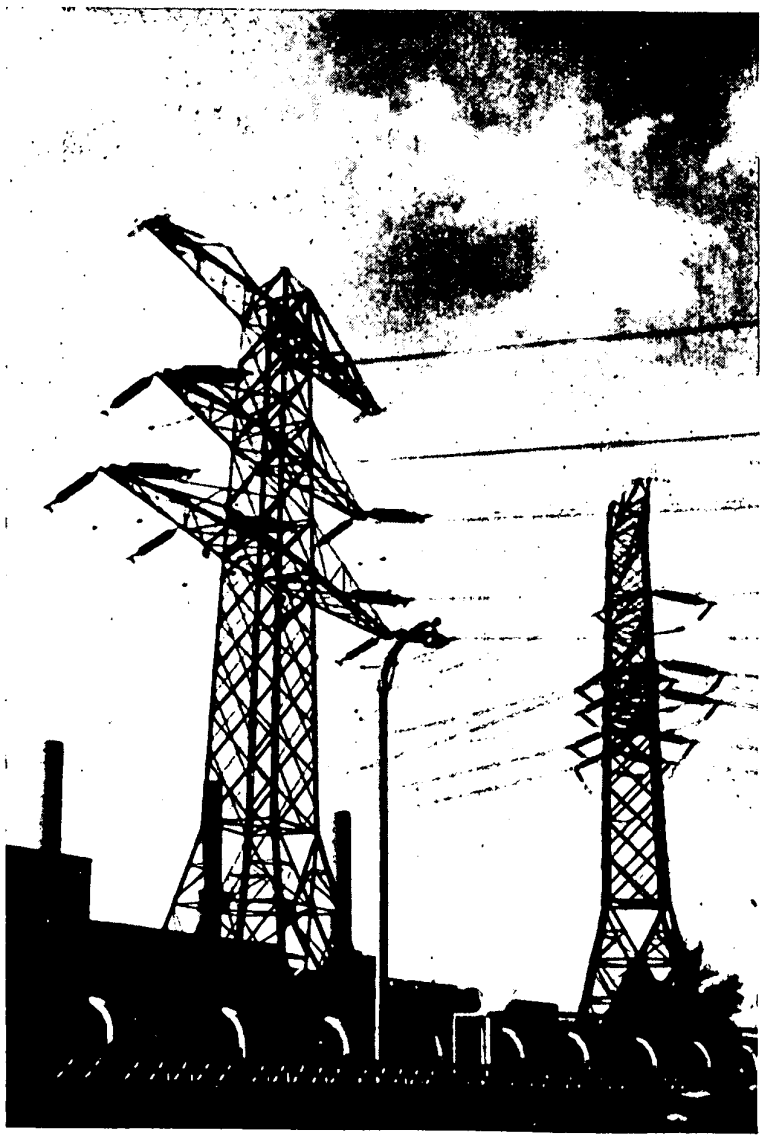
4. ELECTRICAL PLANT LAYOUT

Two alternators of Blachownia I Power Station are contributing directly to the national 110 kV grid by means of two-windings step-up transformers. 10.5/121 kV. 69 MVA.

The other two alternators are connected through 3-windings transformers of 10.5/33/121 kV. 69 MVA to the 110 kV bus-bars and to the 30 kV station The block auxiliaries are supplied from the alternator tappings. The 6 kV switch gear has been erected for general auxiliaries requirements. This gear is supplied from a transformer installed in the 30 kV station. The same station supplies also the starting-up and reserve station.

5. THERMAL LAYOUT

Each block includes two boilers, one turbo-alternator set, feed water heating equipment and evaporators for supplementary water. A five stage regenerative cycle has been adopted. Feed water is heated to 210°C at an economic load of 50 MW Water deaerating is made by means of steam taken from the bleed point No 3 at 135°C. The regenerative feed heating equipment includes two high pressure stages, each stage comprising two parallelly coupled feed heaters in two indepedant lines for feeding the two boilers, of a deaerator and two low pressure stages including the low pressure feed heater and the vacuum heater.



SCHEDULE OF PERFOMANCE AND TECHNICAL INFORMATION (BLACHOWNIA II)

BOILER —

Benson Type Radiant boiler for pulverised coal	
Economic Steam Output	190 t/h
M.C. Steam Output	237 t h
Rated Pressure	209 kg/cm²
Pressure at Superheater outlet	190 kg/cm²
Superheated Steam Temperature	535°C
Feed Water Temperature	250°C
Efficiency at 190t/h steam output	89%
Efficiency at 237t/h steam output	88%

TURBINE —

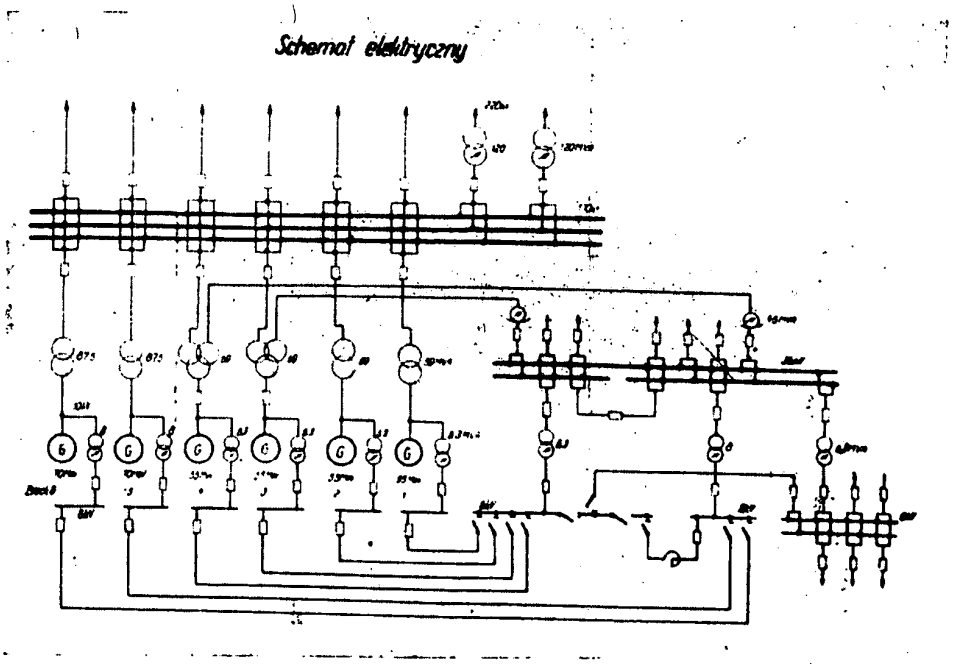
Condensation Type three-cylinder	
Turbine with Intermediate steam reheating	
Manufacturer S.S. W.	
Capacity (Economic/M. C. R.)	60 70 MW
Rated Pressure	180 kg cm²
Rated Temperature	530°C
Speed	3000 revs/min

CONDENSER —

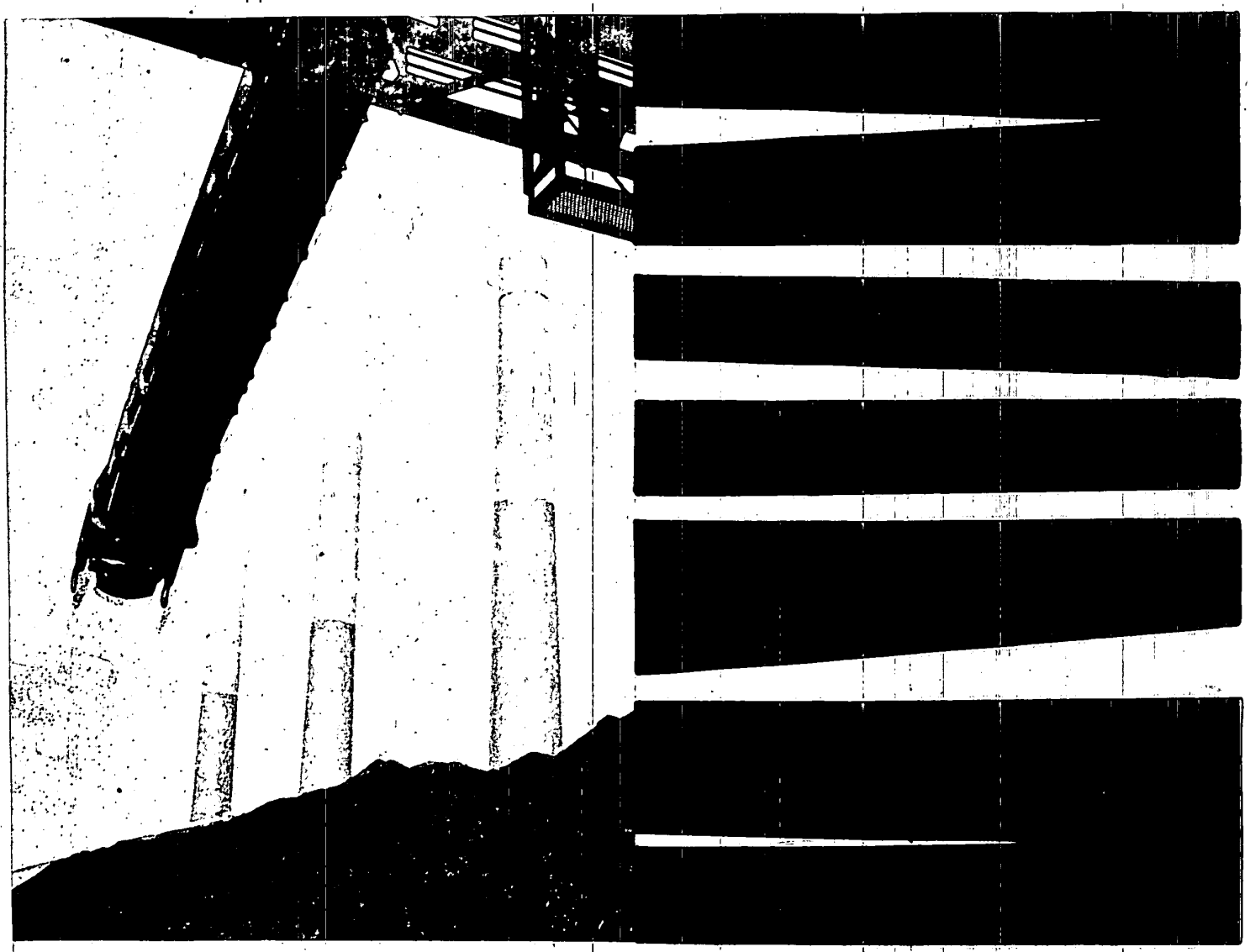
Built of two parts	
Cooling surface	3010 m²
Cooling water temperature	24 C

ALTERNATOR —

Manufacturer	S. S. W.
Rated capacity	87.5 MVA
Power factor	0.8
Voltage	10.5 kV
Hydrogen cooled	



Electric scheme



7. THERMAL LAYOUT

Each block includes one boiler and one turbo-alternator set with interstage steam reheating and feed water heating equipment. Feed water is heated to 240 250°C. A six-stage regenerative cycle has been adopted. Water is being deaerated at 158°C by means of steam taken from bleed point No 4.

8. ELECTRICAL PLANT LAYOUT

The alternators are contributing directly to the 110 kV grid through two-windings step-up transformers of 10.5/121 kV, 87.5 MVA. The auxiliaries requirements are supplied from the alternator tappings.

9. COAL HANDLING PLANT

A railway siding allows coal to be supplied by means of selfunloading wagons of "Talbot" type to gap - type bunkers. In future a wagon hoist for railway wagons will be installed. Coal is carried by belt and bucket conveyors. The coal handling plant includes crushers to assure coal of 0-80 mm in size to be granulated to 0-20 mm. There are two lines of conveyors to supply coal to te boiler house, each being capable to carry the daily requirement within 16 hours. The coal store has a capacity of 85.000 m^3 and is operated by a travelling bridge.

10. WATER SUPPLY

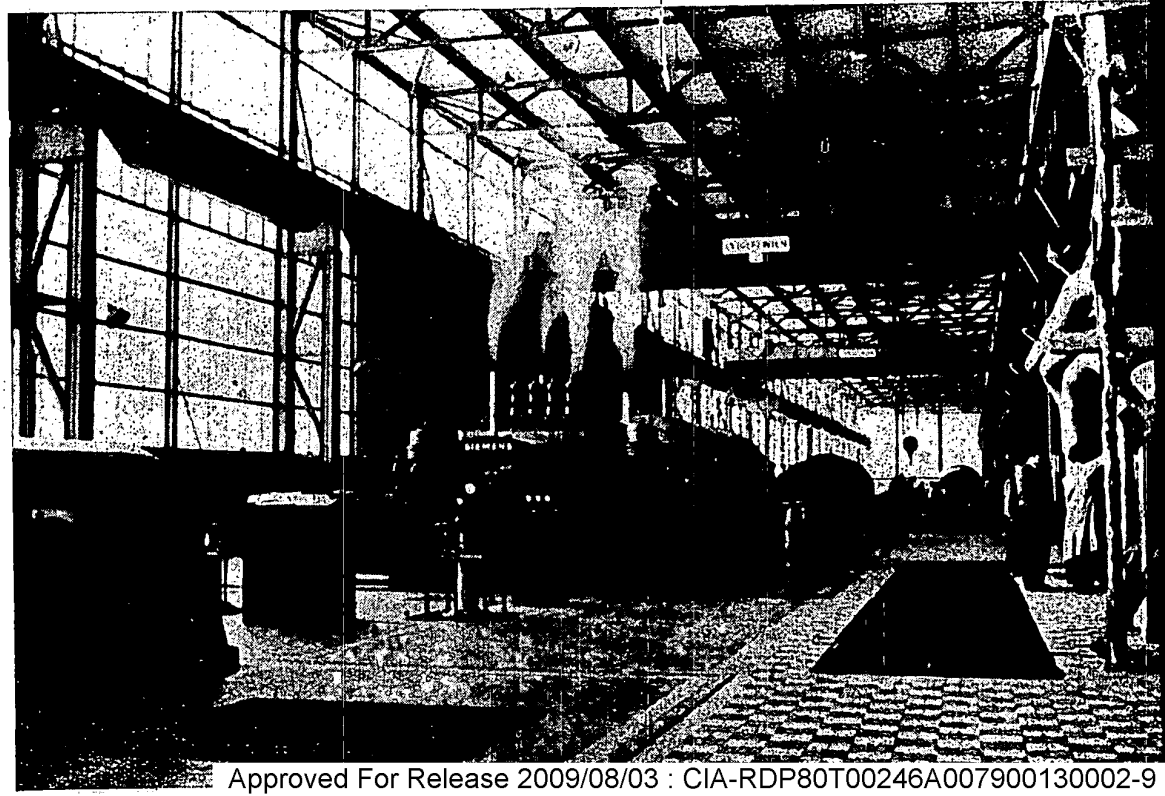
The supplementary water to make up circulating water losses is pumped from a reservoir near the Odra river to the basins and after initial cleaning passes to open gravel strainers placed near the basins. This water is then pumped by pumps installed in the strainer house to the auxiliary pump station. From there it passes through the auxiliary circulating circuit to the main circulating water system.

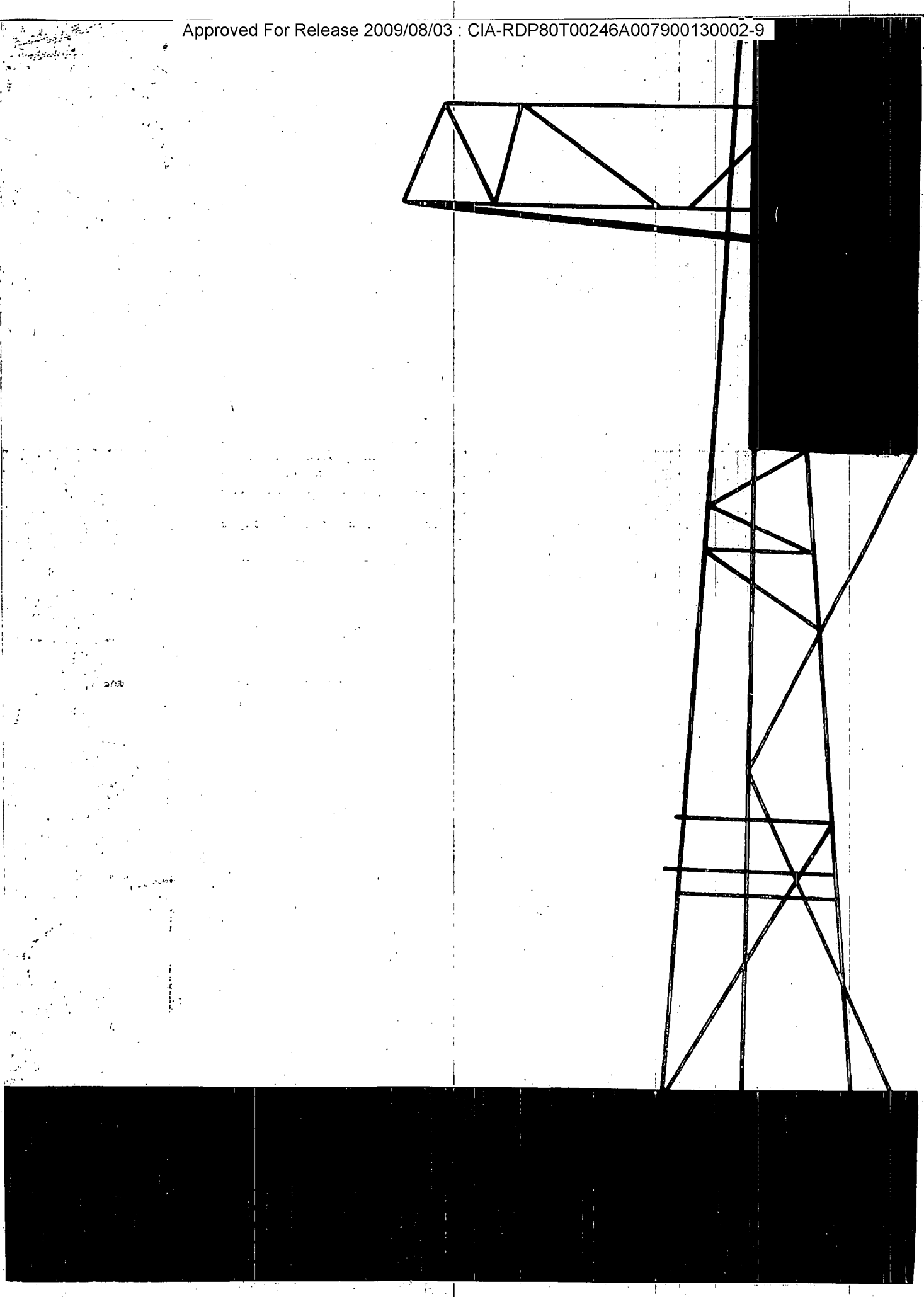
The main cooling water installation for Blachownia I includes four cooling towers of the spray type with 9600m^3/h capacity and six cooling water pumps with a total capacity of 49000 m^3/h. The supplementary feed water is obtained from deep wells. The feed water softening process includes two stages:

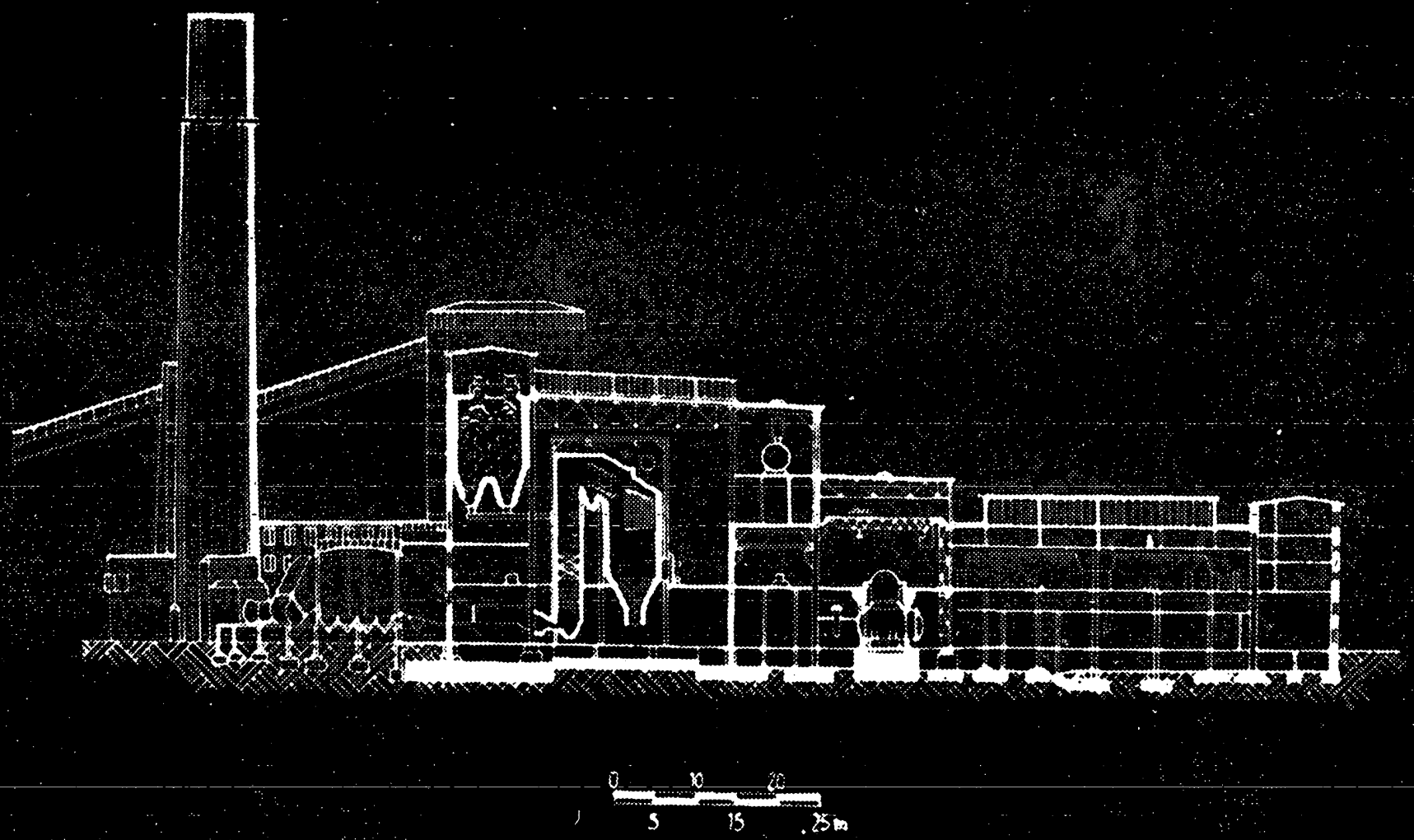
1. Decarburization in a Virbos-type reactor.
2. Softening in sodium-exchangers.

11. ORGANISATION AND LABOUR EMPLOYMENT SCHEME

The organisation and labour employment scheme is based on schemes adopted in West European countries (France).







Sectional view

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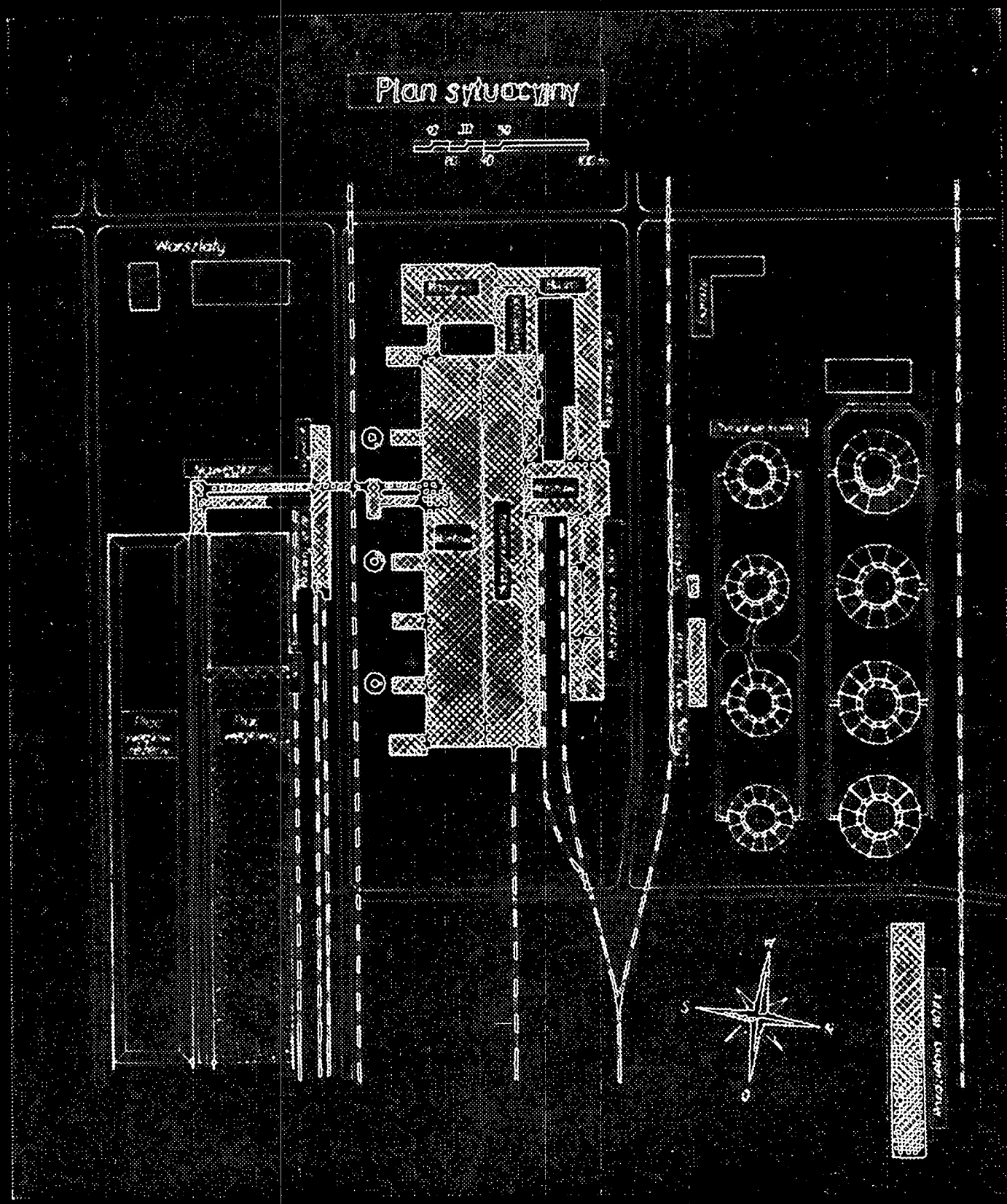
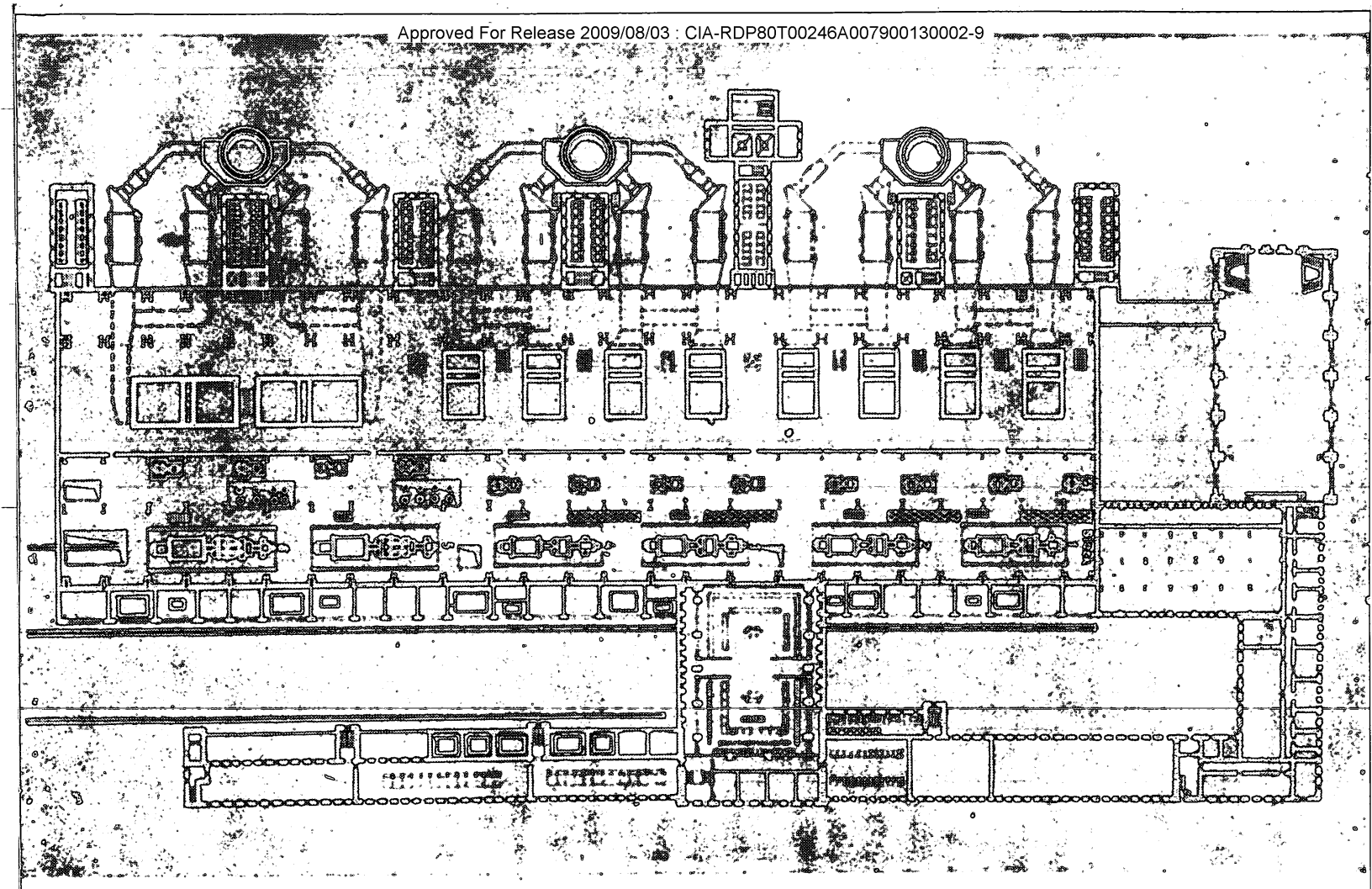
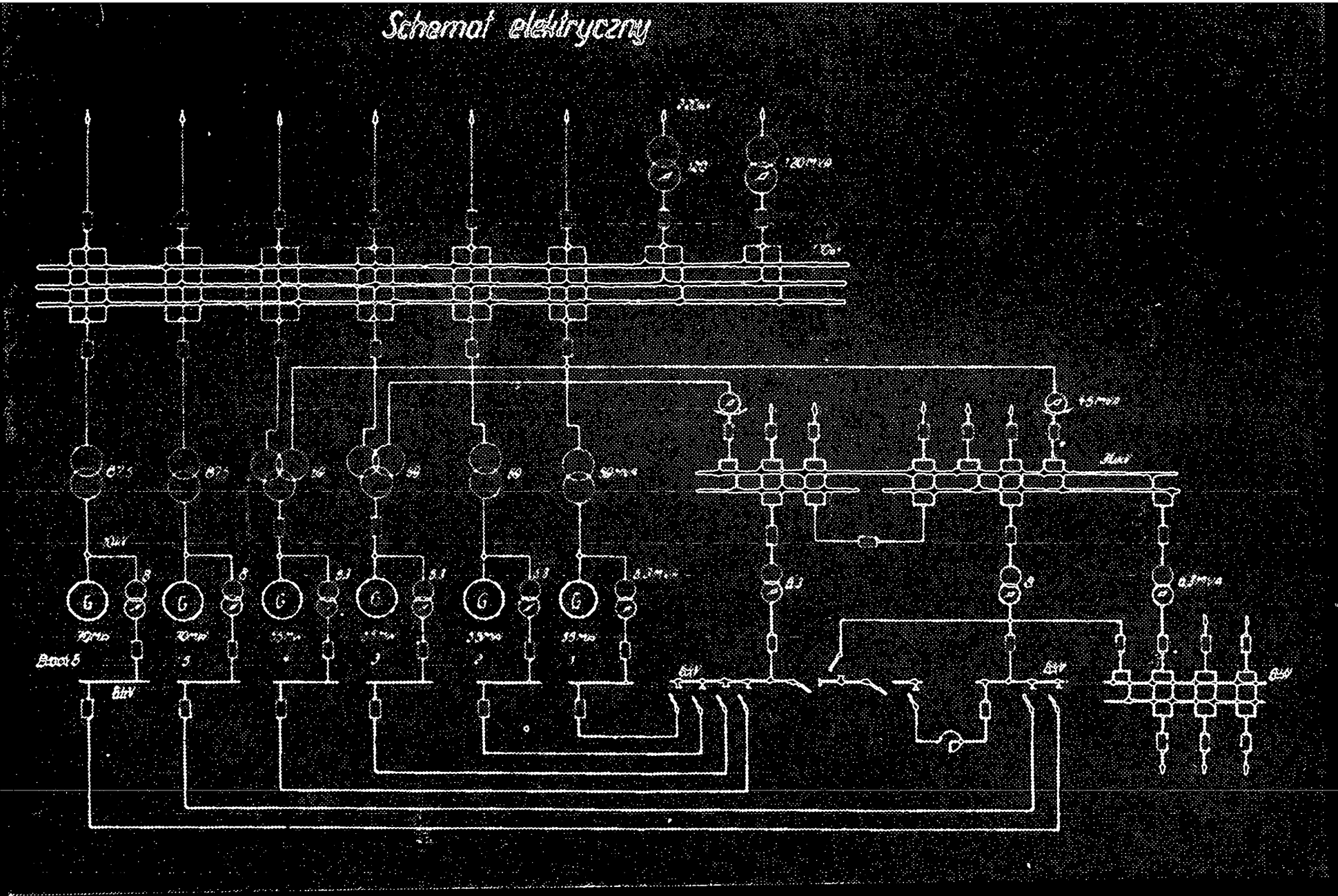


Site plan



Main building site plan



Electric scheme

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